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Foreign Debt Rescheduling and Private Investment in LDCs

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Summary:

This paper attempts to investigate the relationship between foreign debt and repayment problems on investment behavior in Less Developed Countries (LDCs). It is primarily motivated by earlier studies which have found empirical evidence of such a relationship, but did not attempt to incorporate it into a theoretical model which could shed light on the functioning of developing macroeconomies. An effort will be made to address this possibility by modeling the determinants of private investment in LDCs in a way that will allow an examination of the effects of high external debt and repayment problems on private investment. This will be achieved by assuming a parallel informal market for savings which operates by means of a simultaneous equations model of supply and demand. Conceptually, such a model is just an extension of previous attempts to understand the parallel capital markets that arise in the context of interest rate controls and credit rationing common in LDCs. The equations of the resultant private investment model will consider external debt and repayment problems explicitly in terms of their effects on credit ceilings, which are likely to be applicable due to the possibility of countries defaulting on their foreign debt.

Savings will be assumed to clear through arbitrage in the informal capital market by means of an unobserved

interest rate. This will provide a means of analyzing investment while avoiding some of the problems which commonly arise while looking at investment in developing countries. Substitution for the unobserved market clearing interest rate will allow the formulation of a reduced form equation, the signs of whose coefficients may be predicted from the original supply and demand equations. Since the reduced form equation contains only observable variables, its coefficients may be empirically determined.

Background for the study:

The 1980's witnessed historically unprecedented debt repayment problems on the part of many LDCs. The low or negative real interest rates of the 1970's, inflationary oil shocks and an abundance of petrodollar deposits in the international banking system had resulted in large acquisitions of ~~indebtedness~~ during the preceding years. All of these culminated in the debt crisis and the reschedulings of the early 80's. In the light of this, it is natural to ask the question of what the growth effects of these episodes were. Cohen (1991) found that there was indeed a significant negative effect of foreign debt payments on investment for countries that rescheduled their debt. That study also found that countries which did not reschedule experienced a less severe negative relationship between foreign debt repayment and investment.

However, the above result is difficult to understand without further information. Cohen points out that rescheduling activity is associated with markedly different investment behavior, but does not adequately address the causes for such a relationship. This omission is understandable, as the question here is what the determinants of investment in LCDs are, and is one which is not easily answered. To do so will require a model for investment which incorporates the effects of debt repayments and reschedulings. It is the goal of this paper to present such a model.

What the above ultimately requires is a model for private investment in LDC's, as public investment is essentially an exogenous policy variable. That in itself is problematic, however, largely due to the policies of credit rationing and controlled interest rates that are often employed in developing countries. As summarized by Greene and Villanueva (1991):

"A variety of hypotheses have been advanced to explain the variations in private investment observed in developing countries... The neoclassical flexible-accelerator model has been the most widely accepted general theory of investment behavior... However, it has generally been hard to test this model in developing countries, because key assumptions (such as perfect capital markets and little or no government investment) are inapplicable, and data for certain variables (capital stock, real wages, and real financing rates for debt and equity) are normally either unavailable or inadequate."

Since foreign debt related factors are likely to affect growth through investment, the analysis of their effects should take place in the context of a model which explicitly takes into account the characteristics of LDC debt and investment. In particular, the debt related terms must be related to the availability of foreign savings. In the supply and demand model proposed, foreign borrowing can be placed into the supply in a simple manner.

In addition, the adoption of a simultaneous equations model of an informal capital market overcomes the data problem of obtaining meaningful interest rates in the context of repressive credit policies commonplace in LDCs. The widespread effects of government policy in the capital allocation process renders official interest rates largely irrelevant to investment decision making, and allows for the presence of parallel markets whose interest rates must reflect the true costs of and returns from savings.

A parallel savings market is thus essential to the proposed model to enable the use of supply and demand concepts. Informal credit markets have not played a large role in past investment models, having generally been considered relevant only in rural situations where more formal markets are not feasible.' However, there has been some recognition that the creation of credit arbitrage opportunities by capital rationing policies may result in significant permeation of parallel markets into the economy.

The macroeconomic implications of informal credit existing alongside the formal market was examined in terms of its effects on monetary policy by Montiel (1991). The proposal that unregulated parallel market interest rates provide the means of market clearing is perhaps not unrealistic. Even in urban areas, this could take the form of entrepreneurs taking out loans at official interest rates and then lending to a second party (or to themselves) at a higher "market" interest rate. The crucial insight is that the market rate must be higher than the official rate, or officially allocated credit will not clear; thus arbitrage is profitable until an equilibrium is reached. Savings and investment decisions will ultimately be based upon the higher informal rate.

The Private Investment Model:

In attempting to model the supply and demand of private investment in LDCs, an effort was made to incorporate both standard ideas of the determinants of savings as well as some additional features which would serve to account for debt payment and rescheduling effects. While the demand side of the market was kept as simple as possible, the supply side was constructed in a manner which would allow for the interaction of foreign lenders and investors with the domestic economy.

For the purpose of cross-country scaling, all fiscal quantities are expressed as fractions of GNP. GNP was used

rather than GDP as it was thought that international factor payments might be relevant to debt payment behavior.

Supply of Savings:

The analysis of private investment behavior is facilitated if its various sectors are examined separately. Savings available for domestic investment is thus broken up into private savings, government savings and foreign savings. These are related to private investment through the following identity.

Private investment (I^P) is the sum of private and government savings (S^P and S^G) and foreign savings (FS^P and FS^G) less government investment (I^G). Here foreign savings is identically equal to the current account, and includes changes in foreign reserves. *part of foreign savings is*

$$I_t^P \equiv S_t^P + S_t^G + FS_t^P + FS_t^G - I_t^G \quad [1]$$

not changing

Private savings:

Private savings is taken to incorporate savings made by domestic residents and factors of production which remain available for domestic investment. It does not include savings that originate domestically but are subsequently invested abroad through capital flight, as these are no longer available to domestic investors. Such funds will instead form part of the foreign savings component of supply, an elaboration of which will follow. Assuming that savings

decisions will only be affected by foreign interest rates if those savings are intended for investment abroad, it is reasonable that an equation for private savings will contain only domestic interest rates. *very important*

It is assumed that since both taxes (T) and private sector interest payments (IP^p) serve to reduce the income from which savings may occur (taken to be $Y - T - IP^p$), these should both enter the supply equations with negative coefficients.

Savings decisions regarding funds not taking part in capital flight will be based upon both the real official interest rate for rationed credit (r^{RAT}), and a real unobserved informal market rate (r). Though unobserved, the informal interest rate cannot be lower than the official one, or rationed credit will not clear; individuals should choose to borrow through official channels only if the loans available there are at least as cheap as those available in the informal market.. However, some savings should still be generated by the lower r^{RAT} in the official market due to incomplete access to, or information about, the higher returns available from loans in the parallel market. Both official and informal market real interest rates should therefore enter the supply equation with positive coefficients.

By the permanent income hypothesis, high growth rates (GR) are likely to increase the supply of savings in LDCs. Given the uncertainty which many developing economies were

subject to in the sample period, it is probable that wage earners who experienced changes in income during periods of high growth were doubtful that the current income levels would be sustained. According to the permanent income hypothesis, marginal propensity to consume is lower for transitory income than for permanent income. This is especially so when income variability is high, as people will learn from experience not to consume as if the current year is representative of the long-term. Thus savings should be increased by a high growth rate, which should be widely perceived as a temporary phenomenon and therefore induce a high marginal rate of savings from increased incomes. Accordingly, growth rates should have a positive coefficient in the private savings equation.

According to the findings of Serven and Solimano (1991) regarding the negative effects of domestic instability, high inflation rate variation will cause people to lose confidence in the gains from investment and effective government policy. This effect is separate from that of changes in real returns from investment brought about by price fluctuation, which has already taken into account through the use of real interest rates. However, the instability effect is likely to be pronounced only when inflation rates are high; variation in a consistently low inflation rate is unlikely to bring about a significant breakdown of confidence in the government's ability to pursue stable policies. Furthermore, periods of high inflation will often be reflected in correspondingly low

or negative real interest rates, due to the often inflexible qualities of LDC deposit rates. Inflation rates have thus not been included in the demand specification, in order to avoid problems of collinearity with the real interest rate.

*assumed
found*

In the light of the above, private savings (S^P) is modeled as follows.

$$\frac{S_t^P}{Y_t} = \alpha_0 + \alpha_1 \frac{T_t}{Y_t} + \alpha_2 \frac{IP_t^P}{Y_t} + \alpha_3 r_t^{RAT} + \alpha_4 r_t + \alpha_5 (GR_t) \quad [2]$$

Government savings:

This represents the public sector contribution to the supply of savings. Savings of the government can be defined in a simple manner from the public budget constraint. As expressed below, this simply states that government savings (S^G) are equal to tax revenues (T) less government consumption minus grants received ($C^G - GT$) less interest payments on the government debt (IP^G).

Grants received by the government are accounted for by subtracting them from consumption, as grants represent funds whose use will not drain tax revenues from savings. It would perhaps be more intuitive to simply add grants to taxes, as both represent sources of funds from which the government can spend or save. However, this would be problematic in that the two have been proposed to enter the model in very different manners. Specifically, tax revenues should enter the private savings equation with a negative coefficient due

*adding
empirical
the way
not to
of the
model*

to their effects on disposable income; grants have no direct role in private savings.

$$\frac{S_t^G}{Y_t} \equiv \frac{T_t}{Y_t} - \frac{(C_t^G - GT_t)}{Y_t} - \frac{IP_t^G}{Y_t} \quad [3]$$

Foreign Savings:

Availability of foreign savings (FS) which are supplied under risk of default are assumed to be determined by a credit ceiling rather than interest rates. This is in accordance with the theoretical work of Cohen and Sachs (1986) as well as others who have dealt with default risks of highly indebted countries. These risks will probably not be fully represented by interest rates, as countries who intend to default will not be deterred from borrowing by the prospect of high interest payments. Without an intention to repay loans, it makes sense for them to borrow as much as possible before default cuts them off from further credit. In effect, relying solely on interest rates could have the effect of screening out all prospective borrowers except those without commitment to repay. To prevent this screening out of countries who do not intend default through high interest rates, lenders must limit supply at the point where the net marginal benefits of debt servicing and continued inflow of credit is equal to that of the alternative; defaulting on debt payments with the subsequent termination of credit flows.

In addition, some foreign savings will not be supplied under risk of default. These include direct investment and the repatriation of savings invested abroad by domestic residents. These inflows of savings may be thought to occur primarily due to a real interest rate differential.

no parallel
to deposit
risk

Similarly, capital flight may be assumed to take place in an amount depending upon the differential between the foreign real rate (r^*) and the real informal market rate (r). Thus, it is expected that all of these capital flows should produce a positive coefficient for the real informal interest rate and a negative coefficient for the real foreign interest rate in the foreign savings supply.

Rescheduling activity is proposed to affect investment through a lowering of the credit ceiling and a decrease in loan inflows. This could be brought about if it served to increase the lenders' perceptions of a country's riskiness; a country which rescheduled in the past may not be considered credible in its agreements to make payments on time in the future. Of course, such a view is simplistic. It does not account for possible variation according to the type of debt rescheduled, the cause of the rescheduling or the psychological impact on lenders. It is possible that under some circumstances, a negotiated rescheduling may have a positive rather than negative effect on confidence; or even no effect at all. For example, if the need for rescheduling is brought about by what seems to be a one-time external shock, then there would be little cause to consider it an

indication future repayment problems. Furthermore, internal changes, perhaps political in nature, could cause a country to reschedule while at the same time increasing lender confidence and the credit ceiling. This would probably be the case if a change in government resulted in new leadership which lenders perceived as more trustworthy, for whatever reason.

Nonetheless, it is still possible that in general rescheduling has negative effects on the supply of foreign savings. A variable (R) is therefore proposed to model the effect that rescheduling or not rescheduling debt have on lender confidence and the credit ceiling. It is constructed for each country in a given year as $\frac{1}{h}$ (years since the last rescheduling of any debt repayments). This allows a sustained effect which decreases with the passage of time without further repayment problems, as lender confidence is restored. This is in keeping with the results of Cohen (1991) on the negative relationship between rescheduling and foreign investment. If rescheduling really has a negative effect, (R) should have a negative coefficient in the foreign savings equation.

Total scheduled debt payments divided by exports (DP/X) is taken to be a measure of a country's riskiness, in that it represents to what extent total resources, in terms of the country's foreign exchange liquidity constraint, are already expected to be made available for debt service. Scheduled

payments (actual plus rescheduled) are used as it was thought undesirable to reward countries who reschedule their debt and consequently need to use little of their export earnings for debt service. As the variable gets larger, lenders should anticipate future repayment problems and further reduce the ceiling. It is thus expected to have a negative coefficient.

Interest paid as a fraction of GNP is taken to be an indication of how trustworthy and capable of repayment lenders perceive a country to be. It is conceivable that lenders may be willing to extend new loans for principal rescheduling as long as a country shows that it is committed to maintaining high levels of interest payments. In addition, that a country is willing and able to maintain high levels of repayment may in itself be reassuring to its creditors. For this purpose, interest payments made on non-guaranteed debt to the private sector was used. Since these may considered to be the least "official" form of interest payments, it is possible that they will be most representative measure of a country's ability to repay, independent of the debt repayment policies of individual governments. It should be expected to have a positive effect on foreign savings.

The foreign savings equation may thus be written as follows.

$$\frac{FS_t^P + FS_t^G}{Y_t} = \beta_0 + \beta_1 R_t + \beta_2 \left(\frac{DP_t}{X_t} \right) + \beta_3 \left(\frac{IP_t^P}{Y_t} \right) + \beta_4 (r_t^* - r_t) \quad [4]$$

Demand for Savings:

The second component of the private investment model is the demand for savings. This is far simpler than the supply equation, and can be formulated from a few standard ideas pertaining to the macroeconomic situation in LDCs. Among these are complementarity between public and private investment, the accelerator and the real market clearing interest rate.

Long-term complementarity between public investment (I^G) and private investment reflects the possibility that public investment is a reflection of infrastructural development; the lack of which could be an important barrier to opportunity for private investors in LDCs. An increase in infrastructural development would increase demand for savings by encouraging private investors. Blejer and Khan (1984) found this relationship to hold true, using the trend level of public investment as a proxy for infrastructural outlays. They assumed that such investments, which would include expenses on such durables as roads and telecommunications, would vary less from year to year than non-infrastructural components. Hence the trend level would be a better proxy than actual public investment in a given year. However, this assumption ignores the possibility that some non-infrastructural components of public investment are dictated by political necessity. Since the growth effects of non-infrastructural public investment is questionable, it is

possible that these are maintained due to political rather than economic pressures. If so, the trend level of public investment may not be a good indicator of infrastructural outlays, which are likely to carry a good deal of the year to year variation in total public investment due to their low political priority.

In this paper, lagged public investment (IP^G) is used instead of its trend level to account for the possible variability in infrastructural outlays. It is expected that lagged public investment will provide a measure of infrastructural development by at least reflecting the extent to which depreciation was offset. If total public investment was low in the previous year, it may reflect that the stock of infrastructural investment grew only slightly, or may even have decreased if inflexible non-infrastructural outlays prevented depreciation from being covered. Thus the lagged public investment may be expected to have a positive coefficient in investment demand.

Demand for savings can also be thought of as rising with the difference between the present stock of capital and the desired stock of capital. This is easily incorporated through an accelerator model which assumes a constant ratio between income level and desired capital stock. It has the added advantage of permitting the use of income level as a measure of capital stock, for which reliable data do not exist for LDCs. In this case, the change in desired capital

stock between a current and previous year is proxied with the lagged growth rate term (GR_{t-1}), which should therefore enter the demand specification with a positive coefficient.

The final determinant of demand for private investment considered here will be the cost of savings that investors perceive, as reflected by the informal market. The assumption of arbitrage in the informal capital market results in all investment decisions taking place at the higher market clearing rate (r). Even if investors have access to credit at the lower official rate (r^{rat}), they will not make the decision to invest based upon that rate, since they can obtain the higher rate simply by resorting to the informal market. The informal market rate must then represent the true opportunity cost of investment. It should be expected to enter the demand equation with a negative coefficient.

$$\frac{I_t^p}{Y_t} = \gamma_0 + \gamma_1 \frac{I_{t-1}^G}{Y_t} + \gamma_2 (GR_{t-1}) + \gamma_3 r_t \quad [5]$$

Reduced form equation:

Since the supply and demand in the informal market for savings clears through the unobserved interest rate (r), this variable can be substituted out from both supply and demand equations to yield a reduced form equation composed entirely of observable variables.

This is given below. The sum of government consumption minus grants, public investment and government interest payments is lumped into a single variable, government expenditure less grants received (G). This is expected to have a negative coefficient.

$$\begin{aligned} \frac{I_t^P}{Y_t} = & \vartheta_0 + \vartheta_1 r_t^{\text{RAT}} + \vartheta_2 r_t^* + \vartheta_3 \text{GR}_t + \vartheta_4 \text{GR}_{t-1} + \vartheta_5 R_t + \vartheta_6 \left(\frac{\text{DP}_t}{X_t} \right) \\ & + \vartheta_7 \frac{\text{IP}_t^P}{Y_t} + \vartheta_8 \frac{T_t}{Y_t} + \vartheta_9 \frac{G_t}{Y_t} + \vartheta_{10} \frac{I_{t-1}^G}{Y_t} \end{aligned} \quad [6]$$

Since a high official real interest rate (r) is considered to have a positive effect on private savings, it is expected to have a positive coefficient. On the other hand, a high foreign interest rate (r^*) is expected to decrease inflow of foreign savings and should thus have a negative coefficient.

Both current and lagged growth rates (GR) should have positive coefficients, the former through the permanent income hypothesis' prediction for private saving, the latter due to the accelerator component of demand.

The rescheduling variable (R) and scheduled debt service divided by exports (DP/X) are expected to have negative coefficients, through their effects on the credit ceiling and foreign savings.

The net effect of taxes is uncertain, as they affect supply positively through government savings, but negatively

through personal savings. However, they are likely to have a positive coefficient simply because their direct effect on the government budget constraint is likely to be stronger than their indirect effect on personal savings through income.

The sign of the coefficient for interest payments made by the private sector (IP^p) are also uncertain. These serve to reduce personal savings just as taxes do, but also have a positive effect on the foreign savings.

Lagged public investment (I^g_{t-1}) should have a positive coefficient according to the complementarity effects described.

Regression results:

First an OLSQ regression was run. After that, panel regressions were run with countries as identifiers.

OLSO Results:

Dependent variable: IP^p
Std. dev. of dependent var. = 3.95762
Mean of dependent variable = 11.3159
Sum of squared residuals = 4488.61
Variance of residuals = 13.4390
Std. error of regression = 3.66592
R-squared = .166922
Adjusted R-squared = .141980
Durbin-Watson statistic = .562884
F-statistic (zero slopes) = 6.69230

<u>Variable</u>	<u>Estimated Coefficient</u>	<u>Standard Error</u>	<u>t-statistic</u>
intercept	10.0021	.776929	12.8739
I_{t-1}^G	.173551	.070183	2.47285
G_t	-8.56863	3.32804	-2.57468
T_t	11.9502	4.76956	2.50551
r^{RAT}	.352709E-02	.958518E-02	0.367973
GR_t	.769316	3.09648	0.248448
GR_{t-1}	6.57389	2.82091	2.33041
DP/X	-3.78094	1.16342	-3.24986
R	-.896259	.646074	-1.38724
IP^P	102.860	31.6045	3.25461
r^*	.072048	.070997	1.01480

From the above it is apparent that the coefficients of lagged public investment, government expenditure, tax revenues, lagged growth rate and debt payments divided by exports all agreed with the predictions made, and were significant at the 5% level. Interest payments were also significant, and positive in sign; this would imply that their positive effects on foreign savings overwhelm their negative effects through private saving.

The rescheduling variable (R) turns out to be insignificant at even the 10% level, though it is of the right sign. It is possible that this is due to the fact that countries who reschedule principal but maintain timely interest payments represent less of a worry to lenders. If so, the inclusion of the interest payments term may be softening the explanatory power of rescheduling.

Even though some degree of collinearity was expected between the government expenditure, revenue and lagged

investment, all three turned out to be significant, indicating that this may not be a major problem.

The F-statistic shows that the regression as a whole is significant. However, the Durbin-Watson statistic indicates that heteroskedasticity is very likely to be present. R-squared was very low.

However, it is difficult to know how meaningful these results are, due to the fact that the OLSQ regression has not taken into consideration that the data consists of a panel of countries between whom there is a possibility for heteroskedasticity. Heteroscedasticity caused by each country behaving consistently below or above the overall best fit line could also result in the production of autocorrelation within each country's observations.

Panel Results:

The TSP "between" estimates of coefficients, which were the result of an OLS regression on the means of each variable over time, were almost all insignificant. Only the interest payments term remained significant at the 10% level, and retained its positive sign. This result would indicate whatever explanatory power the model has may be over time rather than through means.

The TSP "variance components" estimates, which allow for random effects between countries, are given below. Random

effects could not be ruled out as the correct model through the Hausman test.

Mean of dependent variable = 2.27480
 Std. error of regression = 2.23734
 Std. dev. of dependent var. = 2.19231
 Sum of squared residuals = 1516.73
 R-squared = .084129
 Adjusted R-squared = -.039801
 Variance of residuals = 5.00570

<u>Variable</u>	<u>Estimated Coefficient</u>	<u>Standard Error</u>	<u>t-statistic</u>
IG _{t-1}	.037510	.058771	0.638240
G	-2.76454	4.07362	-0.678645
T	13.2744	6.55925	2.02376
r ^{RAT}	-.554929E-02	.625515E-02	-0.887156
GR _t	-3.50381	2.02371	-1.73137
GR _{t-1}	2.52550	1.85706	1.35994
DP/X	-2.69891	.967176	-2.79051
R	-.314159	.446632	-.703397
IP ^P	-35.9344	28.7480	-1.24998
r*	.015978	.046126	0.346401
intercept	9.88809	1.27773	7.73878

Hausman test of FE vs.RE: CHISQ(10) = 8.1943

With the random effects estimates, only tax revenues and debt payments divided by exports remained significant and of the predicted signs at the 5% confidence level. Growth rate was also significant at the 10% level, but of the wrong sign.

Concluding statements:

The objective of this paper was to attempt to propose a theoretical framework in which the negative relationship between foreign debt rescheduling and private investment in LDCs could be understood. To this end, an attempt was made

to bring together ideas of informal credit markets and credit ceilings which may be particularly relevant and to construct a model of supply and demand which incorporated debt repayment effects.

The empirical results are not very good, however. While the OLSQ results seem promising, their meaning is questionable given the nature of the panel data. By contrast, none of the panel regression results seem encouraging.

$\frac{DP}{X}$

as indicator of growth

to find the panel data that is most appropriate for testing the model structure that is proposed

Appendix regarding Data

Total number of countries: 32. Period spanned: 1971-1989.

Total number of observations: 345.

Maximum number of observations per country: 19.

Minimum number of observations per country: 4.

Countries included: Argentina, Bangladesh, Belize, Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Fiji, Ghana, Guatemala, India, Indonesia, Kenya, Malawi, Malaysia, Mauritius, Mexico, Morocco, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Tanzania, Thailand, Tunisia, Turkey, Uruguay, Venezuela, Zimbabwe.

*but not
Brazil
Peru
Jamaica*

Figures for public and private fixed investment were taken from "Trends in Investment in Developing Countries 1992", produced by the IMF. I am thankful for Peter Montiel's assistance in providing me with this data.

All foreign debt related figures are from the World Debt Tables. Total scheduled debt service was obtained for each year by adding current rescheduling to actual payments made. Rescheduling data were primarily obtained from World Debt tables, and included principal, interest and total debt stock rescheduling. Additional rescheduling data was provided by Barbara Craig, for which I am grateful.

Interest payments on foreign debt used are those made on private non-guaranteed loans.

Fiscal data were obtained from International Financial Statistics, published by the IMF. Taxes were government revenue. Government expenditure and grants received were taken from the corresponding lines. GNP data was taken from IFS where available; otherwise, it was obtained from the World Debt Tables, published by the World Bank.

Interest rate and price data were also from IFS. The foreign real interest rate r^* is constructed from the 6-month Eurodollar rate in London. It was deflated with a GNP-weighted average of inflation rates in OECD countries. Domestic inflation rates were taken from percentage changes in CPIs. GNP was deflated by CPI to calculate real growth rates.

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